一篇论文的死里逃生记

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摘　要

2007 年 *5* 月 *31* 日，我收到一份来自《*Applied Mathematics Letters*》编辑部的电子邮件，它告诉我们：我和田方合作的文章“*Distance Domination-Critical Graphs*”被接收了。这篇文章是我们在 *2005* 年 *3* 月 *31* 日投到该杂志的。*2005* 年 *7* 月 *15* 日收到拒绝函，理由是：审稿人认为我们的结果可以由一个简单的已知结果导出。我们仔细研究了评审者的意见，觉得我们的结果不能由已知结果导出，但评审人提出证明方法可以借鉴。于是，我们给编辑部写信，提出自己的意见，并将修改稿于 *2005* 年 *10* 月 *13* 日重新投到该杂志。其间还有几个回合的邮件来往，在审稿人的帮助下，终于说服了评审者和杂志主编。这件事情也告诉我们：被拒绝的文稿决不要轻易放弃，要仔细分析被拒的理由。如果被拒理由不充分，可以提出自己的理由来说服评审人和主编。兴奋之余，我写下这篇文章的死里逃生记。

§1　论文的完成和投稿

设 G 是图，D 是 G 的顶点子集。如果 $G-D$ 中每个顶点与 D 中点相邻，那么称 D 是 G 的控制集。最小控制集中的点数称为 G 的控制数，记为 $\gamma(G)$。研究图论的人都知道，控制数是重要的图论参数。然而，对于一般图来讲，求控制数问题是 NP-hard 问题。于是，人们转向研究控制临界图。如果对 G 中任何顶点 x，$\gamma(G-x)<\gamma(G)$，那么称图 G 为 γ 临界图。Fulman 等人 [Fulman, J., Hanson, D. and MacGillivray, G., Vertex domination-critical graphs. *Networks*, **25**(2) (1995), 41-43] 证明了：

对任何 γ 临界图 G，如果 $\gamma\geq 2$，那么 G 的直径 $d(G)\leq 2(\gamma-1)$。

推广控制数概念到 k 控制数是自然的。图 G 的顶点子集 D 称为 G 的 k 控制集，如果 $G-D$ 中每个顶点到 D 中点的距离不超过 k。最小 k 控制集中的点数称为 G 的 k 控制数，记为 $\gamma_k(G)$。如果对 G 中任何顶点 x，$\gamma_k(G-x)<\gamma_k(G)$，那么称图 G 为 γ_k 临界图。

我的博士研究生田方对 k 控制数和 γ_k 临界图进行了深入研究，并与我合作完成了论文“Distance Domination-Critical Graphs”。该文是把上面提到的 Fulman 等人的结果推广到 γ_k 临界图上去，得到如下主要结果：

对任何 γ_k 临界图 G，如果 $\gamma_k\geq 2$，那么它的直径 $d(G)\leq 2k(\gamma_k-1))$。特别地，$d(G)\leq 3(\gamma_2-1)$。

2005 年 3 月 31 日，我们把这篇论文投到《Applied Mathematics Letters》。当时该杂志是不能用电子邮件投稿，我们是通过邮局用挂号寄出去的。4 月 20 日，收到该杂志编辑部的电子邮件，告知我们收到了我们的文稿，稿件编号：AML4735，希望提供 $6-8$ 名审稿人，要求是：

1.) A list of 6-8 possible reviewers from the North American Region (full names, complete current address, and email address). US & CANADA ONLY.

2.) Reviewers MUST BE knowledgeable in the subject area of the paper. 3.) Reviewers MUST NOT be members of the Journal's Editorial Board.

我们通过网络搜索，找到有关人的通讯地址，并立即通过电子邮件向他们提供了8名审稿人，其中包括Gerard J. Chang和 Gary MacGillivray。

§2 审稿人意见导致退稿

审稿人名单发出不久，我们很快得到反馈意见。2005年7月15日，我们收到该杂志编辑部书面来函。我们怀着急切的心情打开信件，主编Ervin Y. Rodin教授于2005年6月29日签名的回信和审稿人意见。Rodin教授的信内容如下：

Dear Dr. Xu:

For reason stated in the enclosed comments, the reviewer does not recommend publication of your paper in Applied Mathematics Letters. I will be happy to consider for publication any other papers you may wish to submit.

Sincerely yours,

Prof. Ervin Y. Rodin

读着Rodin教授的信，使我们大失所望，稿件被拒了。我们仔细看看审稿人的意见。只有一个审稿人意见，具体意见如下：

The authors generalize some results from their reference [8] to distance domination. To do so, they provide direct case analysis spanning over five pages. Unfortunately, I believe better results follows those in [8] by the short argument given below. Thus, my recommendation is that the paper not be accepted for publication.

The k-th power of a graph G is the graph G^k with vertex set $V(G^k) = V(G)$ and edge set $E(G^k) = \{xy : \ d_G(x, y) \leq k\}$.

Observation For each $k \geq 1$, the domination number of G^k equals the k-domination number of G.

Lemma For each $k \geq 1$, a graph G is k-domination critical if and only if G^k is domination critical.

Proof This is clear for $k = 1$, so we assume $k \geq 2$ below.

Suppose that G is k-domination critical. Let $x \in V(G)$. By Observation, a k-dominating set of $G - x$ is a dominating set of $(G - x)^k$. Since $(G - x)^k$ is a subgraph of $G^k - x$, it follows that G^k is k-domination critical.

Now suppose that G^k is k-domination critical. A dominating set D of $G^k - x$ that is not a dominating set of G includes no vertex y such that $d_G(x, y) \leq k$. Therefore, no edge of G^k joining a vertex of D to a vertex of $V(G^k) - (D \cup \{x\})$ arises in G^k from a path of length at most k that contains x. It follows that D is a dominating set of $(G - x)^k$, and hence a k-dominating set of $G - x$. This completes the proof.

The authors' Theorem 2.3 then follows immediately from [8] by noting that $\Delta_k = \Delta(G^k)$. A more general statement than Theorem 2.4, which γ_k replacing γ_2 is also a direct consequence of the results in [8].

Although I am sure it is of little or no consolation, I can say that this is not the first paper I have refereed in which I have encountered this exact unfortunate situation.

这里提到的文献 [8]，是指我们在前面提到的 Fulman 等人的文章。从审稿人最后一句话看，遭此厄运的还不至我们这一篇文章。

§3 我们提出反驳意见

收到审稿人意见，我们心情很不平静。等情绪平静下来以后，我们认真地考虑和分析了审稿人的意见，发现审稿人提出利用 k 幂图 G^k 的控制数来研究 G 的 k 控制数的思想是非常好的，我们事先没有想到。他在信中提到的 “Observation” 和“Lemma”是正确的。我们决定采纳审稿人的这个意见，并借鉴这个想法对文稿进行修改，简化某些结论的证明。但审稿报告的部分意见是不正确的。我们修改好文稿，并给 Rodin 写封信，对审稿报告提出我们的看法。

Dear Professor Rodin,

In the first place, we would like to thank the anonymous referee for his/her kind comments and valuable suggestions. We have read the referee's report carefully. Some problems mentioned in the report are explained as follows.

By the referee's two simple lemmas, it is true that our Theorem 2.3, not a main result with a shortly self-contained proof, follows immediately from the results of [8] by introducing the concept of a graph G^k. We, however, do not agree with the referee's comment "a more general statement than Theorem 2.4 with γ_k replacing γ_2, is also a direct consequence of his two lemmas and the results in [8]". We want to know how the referee can deduce our Theorem 2.4 from results in [8]. According to the clues provided by the referee, we attempt to prove the referee's claim as follows.

Lemma For any positive integer $k \geq 1$, if x and y are two vertices in G satisfying $d_G(x,y) = d(G)$, then $d_{G^k}(x,y) = d(G^k)$. Furthermore, $d(G^k) = \left\lceil \frac{d(G)}{k} \right\rceil$.

Proof Suppose x and y are two vertices in G such that $d_G(x,y) = d(G)$. If $d_{G^k}(x,y) < d(G^k)$, then there must exist two vertices x' and y' such that $d_{G^k}(x',y') = d(G^k)$. By the definition of G^k, we get a contradiction for $d_G(x',y') > d_G(x,y) = d(G)$.

Let $d(G) = mk + t$, where $0 \leq t < k$. For $t = 0$, we have $d(G^k) = m = \frac{d(G)}{k}$ by the definition of G^k. For $t \neq 0$, let x and y are two vertices in G such that $d_G(x,y) = d(G)$, and we consider an xy-path of length $d(G)$. Then there must exist a vertex v on this xy-path such that $d_G(x,v) = mk$ and $d_G(v,y) = t$. By the definition of G^k, we have $d_{G^k}(x,v) = m$ and $d_{G^k}(v,y) = 1$. Therefore, $d(G^k) = d_{G^k}(x,y) = d_{G^k}(x,v) + d_{G^k}(v,y) = m + 1 = \left\lceil \frac{d(G)}{k} \right\rceil$. ∎

By the results in [8] that if G is a γ-critical graph then $d(G) \leq 2(\gamma - 1)$, and the above lemma, we have, for any γ_k-critical graph G,

$$\frac{d(G)}{k} \leq d(G^k) \leq 2(\gamma(G^k) - 1) = 2(\gamma_k(G) - 1) \Rightarrow d(G) \leq 2k(\gamma_k - 1).$$

For $k = 2$, we have $d(G) \leq 4(\gamma_2 - 1)$.

But our Theorem 2.4 is that $d(G) \leq 3(\gamma_2 - 1)$, and this bound is best possible. This result is our main result in our paper and, we think, the method used in the proof is correct and very nice.

We have adopted the suggestions partially and revised our paper. Now, we resubmit it to you. We would appreciate you very much if you can consider it again for possible publication in your journal.

Thank you very much!

Sincerely Yours,

Jun-Ming Xu and Fang Tian

2005 年 10 月 7 日，我们将修改好的文稿，连同这封信 (letter-Aml4735) 做为附件，通过电子邮件，发给了主编 Rodin 教授，并写了几句话：

Dear Prof. Rodin,

Thank you for sending the airmail dated June 29, 2005 and the referee's report on the above manuscript. Unfortunately, however, we were told that our manuscript can not be accepted for publication since the referees did not recommend publication. The authors carefully read the referee's report, but we do not agree with the referee particularly, see attached file (letter-Aml4735). We revised the manuscript and send you the revised version (AML4735.pdf). The authors would greatly appreciate if you can consider it again for possible publication. In the meantime, if you have any questions about this paper please fell free to contact me. The authors are looking forward to publication of this paper in your esteemed journal.

With best regards,

Jun-Ming Xu

§4 一线希望

一年多时间过去了，该稿件没有任何消息。我们曾多次发电子邮件到编辑部询问，得到的均是自动回复：

Thank you for your interest in Applied Mathematics Letters. This is an automated response. Your message is important to us and we will respond to it at our earliest opportunity if a response is necessary.

2007 年 3 月 20 日，我们收到主编 Rodin 教授的电子邮件：

Dear Dr. Xu

It has come to our attention that the new version of "Distance Domination-Critical Graphs" has been derived from the Lemma 2.3 that appears in the referee's report.

I suggest that you include as statement in the manuscript "Theorem 1 and its proof are due to G. MacGillvray [unpublished] and are used here with his permission".

Please let me know what your reaction is to this recommendation.

Sincerely,

Ervin Y. Rodin

从这封信中，我们看到了一线希望，并且知道，文稿的评审人之一就是 MacGillivray 教授，他是文献 [8] 的作者之一。只要他允许我们利用他的未发表的结果，文章接收看来没有问题。2007 年 3 月 22 日，我们给 MacGillivray 教授发去电子邮件，附上我们的修改稿，并写了一封信：

Dear Professor MacGillivray,

My manuscript "Distance Domination-Critical Graphs" has been submitted to Applied Mathematics Letters. One of the anonymous referees for giving the concept of the graph G^k and some results (Lemma

2.2 and Lemma 2.3), which led to some results on G^k (Lemma 2.4 and Theorem 3.3) and the final improved version of it, see attached file. The editor in chief, Professor Rodin wrote me to suggest us to include as statement in the manuscript "Lemma 2.3 and its proof are due to G. MacGillvray [unpublished] and are used here with his permission". I would greatly appreciate if you can allow me to do so or give other suggestions or advices.

I am looking forward to you reply.

Sincerely,

Jun-Ming Xu

2007年3月27日，我们收到MacGillivray教授给我的友好回信：

Dear Jun-Ming Xu,

Yes, I did find the results you mention some time ago, with essentially the same proofs as are given. It was never my intention to write a paper containing these, so you have my permission to use them so long as credit is given. What the editor suggests is acceptable to me.

Sincerely,

Gary MacGillivray

我们收到MacGillivray教授的回信非常高兴，马上回信，对MacGillivray教授表示感谢：

Dear Professor MacGillivray,

Thank you very much for your permission. I will revise my manuscript according to the editor suggests.

Sincerely,

Jun-Ming Xu

当天，我们就把MacGillivray教授的信和我们的修改稿发给了Rodin教授，并给他写了封信：

Dear Professor Rodin;

Thank you for your massage. The attached files are the letter of Professor MacGillvray and the revised version of the manuscript, in which you can find that the result (Lemma 2.3) and its proof appeared in the version have got a kind permission of Professor MacGillvray. A statement "Lemma 2.3 and its proof are due to G. MacGillvray [unpublished]" has been added in Remarks under the lemma, and a tribute to him is in Acknowledgement. Please let me known if you have any questions on the manuscript. I and my co-author are looking forward to its publication in Applied Mathematics Letters.

Best regards,

Jun-Ming Xu

§5 柳暗花明，曙光再现

2007年5月31日，我们收到Rodin 教授的助理Amanda Vaughn的电子邮件：

Dear Dr. Xu

I am pleased to inform you that your manuscript, AML4735, "Distance Domination-Critical Graphs" has been accepted for publication in Applied Mathematics Letters. A formal acceptance letter will be sent to you via post when we receive the information below.

We ask that you send your digital in the form of: Tex, LaTex, AmsTex, or Word of your manuscript.

If your paper contains figures, please send them in separate attachments (ps or eps are accepted). Thank you in advance!!

This information can be sent by email. Please send the Tex, LaTex, AmsTex, or Word named as the AML reference number (for example, AML####.tex).

Amanda Vaughn

Prod. Assn't to E Y Rodin

Applied Mathematics Letters

接到接收函，这是一件值得高兴的事。被拒绝的文稿，通过据理力争，终于说服了评审人和主编，得以接收。这件事情也告诉我们：被拒绝的文稿决不要轻易放弃，应该仔细分析被拒的理由。如果被拒理由不充分，可以提出自己的理由来说服评审人和主编。

§6 后记

2007 年 6 月 1 日，我按照编辑部的要求很快发去文稿的 Tex 源文件。6 月 26 日，签好出版合同；7 月 5 日收到校样，7 月 24 日，该杂志的网页上发布了此文章。